

**Amendments to the Drawings:**

The attached sheet of drawings includes changes to Fig. 2A. This replacement sheet, which includes Figs. 2A and 2B and is labeled "Replacement Sheet", replaces the original sheet including Figs. 2A and 2B.

In Fig. 2A, the lead line from 220 is amended to point to the lower section of cyclone scrubber 120.

### **REMARKS**

The Examiner is thanked for the performance of a thorough search.

In amended Fig. 2A, the lead line from 220 is amended to point to the lower section of cyclone scrubber 120.

Prior to this amendment, Claims 1-22 were pending in the application, with Claims 1-15 and 22 withdrawn from consideration. By this amendment, Claims 16, 18 and 19 are amended, Claim 17 is cancelled and a new Claims 23 and 24 are added. Hence, Claims 1-16 and 18-24 are pending in the application, with Claims 16, 18-21, 23 and 24 currently under examination.

### **SUMMARY OF THE REJECTIONS/OBJECTIONS**

Claims 16-21 were rejected under 35 U.S.C. §112, first and second paragraphs, as allegedly indefinite; Claims 16 and 19-21 were rejected under 35 U.S.C. §102(b) as allegedly anticipated by Holst et al. ("*Holst*", U.S. Patent No. 5,955,037); and Claims 17 and 18 were rejected under 35 U.S.C. §103(a) as allegedly unpatentable over *Holst* in view of Miczek ("*Miczek*", U.S. Patent Number 3,722,185).

### **THE REJECTIONS NOT BASED ON THE PRIOR ART**

Claims 16-21 were rejected under 35 U.S.C. §112, first and second paragraphs, as allegedly indefinite for failing to particularly point out and distinctly claim the subject matter which applicants regard as the invention. Specifically, the Office Action alleges that it is impossible to determine the structure of the claimed elements and the equivalents thereof, as required by 35 U.S.C. §112, sixth paragraph, because the Specification does not disclose adequate structures corresponding to the "heat exchange means" and the "wetting means." This rejection is traversed.

As described in paragraphs [0018]-[0020], in addition to removing particulate-phase and highly water-soluble gas-phase components of the waste gas stream, cyclone scrubber 120

cools the waste gas stream from its elevated temperature from inside the thermal oxidizer 110 and, therefore, functions as the heat exchange means for cooling as recited in Claim 16. More specifically, spraying high pressure water, via spray inlets 260 and spray atomizers 310 (see Fig. 3), through the wall of water cascading down the inner surface of the inner tube 212, significantly reduces the temperature of the waste gas stream coming from the thermal oxidizer 110. In practice, the rapid and efficient reduction of the temperature of the gas stream allows for earlier transition to plastic components that are inert to acid gases and thus do not corrode due to such gases.

Furthermore, it has been discovered that accumulation of particulate matter tends to occur in cyclone scrubbers unless the surface of the scrubber is coated with water. Hence, the cyclone scrubber 120 also functions as the wetting means recited in Claim 16. More specifically, creating a vortex of water swirling in the annulus 225 between inner tube 212 and outer tube 214, via the angular positioning of injection port 230, creates the conical surface of the water so that all the gas-contacted surfaces are wetted, including the entire inner surface of outer tube 214. This technique contributes to the anti-clogging characteristics of the cyclone scrubber 120.

As the Office Action indicates, Claims 17 and 18 further recite the structure of the wetting means and heat exchange means, respectively. The specification alone, and the application's disclosure as a whole (including the claims), *does* describe to one skilled in the art adequate structures that correspond to the claimed elements of Claims 16-21. With reference to Figs. 2A, 2B, 3 and paragraphs [0019] through [0023], it is clear that the combined functionality of inner tube 212, outer tube 214, associated annulus 225, injection port 230, spray inlets 260 and spray atomizers 310 of upper section 210 of cyclone scrubber 120 provide the wetting means and heat exchange means. These structures and their equivalents are

described, in the referenced figures and paragraphs of the application, in a sufficiently clear and concise manner to fulfill the requirements of 35 U.S.C. §112, first paragraph, with respect to enabling one skilled in the art to make and use embodiments of the invention.

Claim 16 is amended herein to recite “a cooling section of a cyclone scrubber” and “a scrubbing section of the cyclone scrubber.” Hence, the language of Claims 16-21 particularly points out and distinctly claims the subject matter embodied in the respective claims, which applicants respectively regard as the invention. Associated description of the subject matter claimed in amended Claim 16, for example, is found at paragraphs [0019]-[0021] and Figs. 2A and 2B.

Based on the foregoing, withdrawal of the rejection of Claims 16-21 under 35 U.S.C. §112 is respectfully requested.

#### THE REJECTIONS BASED ON THE PRIOR ART

##### Rejection under 35 U.S.C. §102(b)

Claims 16 and 19-21 were rejected under 35 U.S.C. §102(b) as allegedly anticipated by *Holst*.

Claim 16 is amended to recite that the cyclonic water flow extends beyond an upper end of the inner tube and cascades over the top of the inner tube so that all gas-contacted surfaces within the cooling section are wetted, which includes the entire inside surface of the outer tube 214 and the entire inside and outside surfaces of the inner tube 212. Paragraph [0020] describes the conical aspect of the free surface 250 of the water, as depicted in Fig. 2A. Configuring the system, namely the relative distance (i.e., the margin of paragraph [0020]) between the inner tube 212 and the outer tube 214 and the angular positioning of injection port 230 of cyclone scrubber 120, to produce the proper scour velocity to obtain the benefit of wetting all the gas-contacted surfaces is not taught, suggested or motivated by *Holst*. With

reference to Fig. 13 of *Holst*, it is clear that, at best, only surfaces associated with the lower annular section 1030 are wetted. Thus, the surfaces associated with the entire upper annular section 1008, some of which are contacted with the waste gas stream, are left dry and, therefore, subject to clogging with particulate matter.

Claim 16 is further amended to recite that the cooling section and the scrubbing section are part of a cyclone scrubber (e.g., cyclone scrubber 120 of Figs. 1 and 2A). In contrast, Fig. 10 of *Holst* illustrates an inlet 606 (col. 19, lines 36-51) that is distinct from and not even adjacent to scrubber unit 710 (col. 21, lines 3-8). By contrast, the inlet 606 is adjacent to, and feeds, a wet pre-treatment tower 634. Hence, the inlet structure of *Holst* is associated with a cool pre-treatment tower, external to the actual scrubber, in contrast to the embodiment recited in Claim 16 in which the cooling section is part of the cyclone scrubber 120 that follows a thermal oxidizer 110, thereby cooling via the heat exchange means the extremely hot gases exiting the thermal oxidizer 110.

For all of the foregoing reasons, Claim 16 is not anticipated by *Holst* and is, therefore, patentable over the cited references of record. Claims 19-21 depend from Claim 16 and, therefore, are patentable over the cited references of record for at least the same reasons as Claim 16. Withdrawal of the rejection of Claims 16 and 19-21 under 35 U.S.C. §102(b) is requested.

In addition, amended Claim 19 recites the use of water atomizers extending into the annulus near the outside surface of the inner tube (see, e.g., Fig. 3) for forcing contact between pressurized water droplets and particulate matter in the waste gas stream, primarily in the inner tube, causing the particulate matter to adhere to the pressurized water and, thereby, absorb acid gases. *Holst* does not teach, suggest or motivate use of atomizers for spraying high pressure water, via spray inlets 260 and spray atomizers 310 (see Fig. 3), through the wall of water

cascading down the inside surface of the inner tube 212. The inlet illustrated in Fig. 13 of *Holst*, the content and associated description on which the Office Action relies for the rejection of Claims 16-18, does not contemplate or provide accommodations for configuring atomizers through the wall of the outer tube into the annulus to affect the water cascading down the inside surface of the inner tube and effectively creating micronized water particles (e.g., a mist) that absorb some particulates and acid gases from the waste gas streaming through the inner tube. Therefore, Claim 19 is patentable over the references of record for this additional reason.

Furthermore, Fig. 1 illustrates that the cyclone scrubber 120, of which the atomizers are part, follows a thermal oxidizer 110 and, therefore, affects particulates and acid gases that are at a high temperature (e.g., 500 C to 850 C is described in paragraph [0017]), albeit while such gases are being cooled by the heat exchange means in the cooling section of the cyclone scrubber 120. In contrast, the atomizers of *Holst* are used in a pre-treatment unit before a heated oxidation chamber and while the particulate and acid gases are at a low temperature (col. 10, lines 21-26). Applicant submits that the particulate/acid gas absorption effect imparted, in part, by the atomizers is much more effective with hotter gases and less effective with cooler gases. Regardless, *Holst* does not teach, suggest or motivate such a configuration of atomizers in relation to a heated oxidation chamber and, therefore, does not anticipate Claim 19.

#### Rejection under 35 U.S.C. §103(a)

Claims 17 and 18 were rejected under 35 U.S.C. §103(a) as allegedly unpatentable over *Holst* in view of *Miczek*.

Claim 17 is cancelled because its features are now recited in amended Claim 16. Claim 18 depends from Claim 16 and, therefore, is patentable over the cited references of record for at least the same reasons as Claim 16. Furthermore, Claim 18 recites heat exchange means and

the heat exchanger of *Holst* is configured in a heated oxidation unit, not a cyclone scrubber. Still further, one skilled in the art of heat exchangers would not likely look to the *Holst* or *Miczek* references, in the art of removing particulate matter and acid gases, for teachings with respect to heat exchange. For all of these reasons, *Holst* in view of *Miczek* would not make Claim 18 obvious to one skilled in either of the aforementioned arts. Withdrawal of the rejection of Claim 18 is requested.

Furthermore, the Office Action conceded that Claim 17 was a linking claim, but maintained the restriction requirement because Claim 17 was considered unpatentable (paragraph 1). Similarly to the former Claim 17, Claim 18 is a claim to a product linking a process of using, as recited in Claim 22. Thus, the position that a restriction between Groups III and IV is improper is repeated herein, based on Claim 18 linking a product to a process of using recited in Claim 22. As shown above, Claim 18 is now patentable over the references of record. Therefore, Claim 22 should be reinserted into the examination process and allowed over the cited references of record.

#### NEW CLAIMS

New Claims 23 and 24 recite that the cooling section of the cyclone scrubber, and the cyclone scrubber, respectively, are coupled to and follow a thermal oxidizer. No new matter is introduced into the application by way of this new claim because the order and configuration of the component elements within such an embodiment of the treatment system are illustrated in Fig. 1 and described at, for example, paragraphs [0007], [0015], [0017] and [0018] of the specification.

The significance and some of the benefits of the order and configuration of the component elements within the treatment system, i.e., the cyclone scrubber 120 following the thermal oxidizer 110, are described throughout this response. In general, the particulate and

acid gas absorption effect and the anti-clogging effect are much more effective with a relatively hot waste gas stream rather than cooler gases.

### CONCLUSION

For the reasons set forth above, it is respectfully submitted that all of the pending claims currently under examination (Claims 16, 18-21, 23 and 24) are now in condition for allowance. It is further submitted that Claim 22 should be reinserted into the examination process and allowed over the cited references of record. Therefore, the issuance of a formal Notice of Allowance is believed next in order, and that action is most earnestly solicited.

The Examiner is respectfully requested to contact the undersigned by telephone if it is believed that such contact would further the examination of the present application.

Please charge any shortages or credit any overages to Deposit Account No. 50-1302.

Respectfully submitted,

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Attachment: Replacement Sheet

#### CERTIFICATE OF MAILING

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